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INSECT NOTES FOR 1906.

This bulletin contains notes upon the brown-tail moth; Aroostook potato insects; alder blight and attendant insects; the larch case bearer; and brief notes upon the other chief insects of the year.

Requests for bulletins should be addressed to the
AGRICULTURAL EXPERIMENT STATION,
Orono, Maine.

MAINE

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INSECT NOTES FOR 1906.

EDITH M. PATCH.

BROWN-TAIL MOTH AND GYPSY MOTH.

Since 1903 the brown-tail moth has become established throughout the Southern and most of the coast counties of Maine. In December, 1906, egg clusters of the gypsy moth were found in Kittery and Elliot. The caterpillars of the brown-tail moth are capable of ruining orchard, shade, and many woodland trees. They are also a dreaded nuisance because their hairs break off and on coming in contact with the human skin, cause extreme irritation and often illness. The caterpillars of the gypsy moth attack nearly every kind of vegetation and their work is especially fatal to pine and other evergreens since these trees always die after being once defoliated.

BROWN-TAIL MOTH.

So serious a pest should be known by every one in the State, because although extermination of this insect may not be possible, much practical and effectual work can be done in holding it in check and reducing its numbers to such an extent that damage to orchard and shade trees may be very slight.

For the past two years the State Department of Agriculture, the State Pomological Society, the Maine Agricultural Experiment Station, the town and city officials, and the citizens of the infested localities have worked in unison against the brown-tail moth. As a result this insect has not yet done very serious damage in this State, and the cases of poisoning have been very few. This is cause both for congratulation and encouragement for it shows that even if the brown-tail moth cannot be exterminated, its ravages may be in a large measure controlled. But the same distressing conditions threaten the State this coming year, and over a much larger district, and to be met successfully these conditions must be met as vigorously and as earnestly as they have been previously.

A simple warning to any one who may not be alive to the importance of fighting this insect is given in this bulletin by the significant photograph kindly supplied by Mr. A. H. Kirkland, State Superintendent for Suppressing the Gypsy and Brown-tail Moths in Massachusetts. The photograph, Fig. 16, shows apple trees stripped by caterpillars of the brown-tail moth, June 9, 1905, Winchester, Mass.

DESCRIPTION AND HABITS.

The moths. The moths, expanding from one and one-fourth to one and three-fourths inches, are white except for the abdomen, which is tinged with brown and tipped with a tuft of brown hairs. This tuft is small and dark in the male, but the large golden-brown tuft in the female is conspicuous enough to be the most striking characteristic of the moth, and has won for this insect its descriptive name of "brown-tail." These moths are on the wing in July, and unlike some closely related pests, the brown-tail females as well as the males are strong fliers. They are active at night, and as lights have an attraction for them, they sometimes fly a long way toward a lighted district.

The eggs. The female usually selects a leaf near the tip of the branch on which to deposit from 150 to 300 eggs. Some of the brown hairs from the abdominal tuft adhere to the egg-mass and give it the appearance of a brown felt lump.

The caterpillars in the fall. By the middle of August most of the eggs are hatched and the young caterpillars spin a slight web over the leaf near the egg cluster. From this protection they advance side by side, sometimes 200 tiny caterpillars feeding in an unbroken line, though they huddle together beneath the web when disturbed in any way. When they have eaten all but the skeleton of the first leaf, they draw another into the web and repeat the process at intervals during the late summer. They feed slowly, however, and spend so much time spinning their web that they do comparatively little damage to the trees in the fall, and they are still very small, (about one-fourth of an inch in length,) when cold weather comes on.

The Winter Nests. In the fall the young caterpillars weave additional layers of silk about their retreat, fastening it securely to the branch by the web, and pass the winter thus in colonies of 150 to 300. This is a very unusual yet most commendable habit in a caterpillar pest, for they can be killed, hundreds at a

time, simply by burning the nests in which the colonies hibernate. The nests, composed of leaves bound firmly together by silken web, are varied in shape, those upon oak trees for instance being differently formed from those upon wild cherry, in accordance with the difference in the size and pliability of the leaves. They vary too, more or less, upon the same tree, in the number of attachments to the twig and somewhat in size. However, this variety in size and shape serves as a distinctive mark, as it distinguishes nests of the brown tail moth from the uniform and regular shaped cocoons of other moths found often upon orchard trees in winter. In spite of the superficial variety, the essential characteristics of the brown-tail moth nests are soon learned, and even anyone unfamiliar with the nest can make himself perfectly certain if he will cut carefully into the nest. *If the structure contains one or more silken cells filled with tiny living caterpillars it is the winter nest of the brown-tail moth.* Two types of the winter nests are shown in Figs. 17 and 18.

The caterpillars in the spring. Early in the spring the young caterpillars emerge from their winter nests and feed upon the opening leaf buds. Until about the middle of June they feed greedily upon the leaves, completely stripping the trees where they are numerous. Orchard trees are especially susceptible, but oak, elm, and many other shade and forest trees are often ruinously attacked. When full grown the caterpillars are about one and one-half inches long. They are dark brown with a sprinkling of orange. Long, fine reddish-brown hairs cover the body, and a row of conspicuous white hairs runs along each side. Like the caterpillars of the tussock and gypsy moths, they bear bright red tubercles on the top of the sixth and seventh abdominal segments.

Poisonous qualities of the caterpillars. Were the caterpillars to be feared only for their ravages upon orchard and other trees, the situation would be alarming enough, but not less serious is the physical discomfort experienced by people living in infested districts. When the minutely barbed hairs of the caterpillar come in contact with the skin they cause an eruption similar to and in many cases worse than ivy poisoning. These hairs are brittle and where the caterpillars are numerous few people are likely to escape, as the caterpillars drop from the branches and creep about, even entering houses. Direct contact with the insects themselves is not necessary however, for when the cater-

pillars shed their skins the molts are blown about, widely scattering the barbed hairs. Thus in infested districts it is no uncommon occurrence for whole families to suffer from the rash caused by the hairs which settle upon clothes hung out to dry. Children gathering cherries are badly "poisoned," and people have been obliged to leave their homes for uninfested places in order to recover from attacks of the "caterpillar rash," which sometimes results in serious illness.

The cocoon. The caterpillars are usually full grown in June. They then spin loose cocoons, attached commonly to leaves, though sometimes other shelter is sought. Within these they transform to brown pupæ about three-fourths of an inch long. From the first to the twentieth of July the moths with pure white wings and brown-tipped abdomens emerge from these cocoons to deposit eggs for the next generation of caterpillars.

REMEDIAL MEASURES.

Natural Enemies. In the course of time, the natural enemies may become established also and take their share in the work. Doctor Howard, Chief of the Bureau of Entomology, and Mr. A. H. Kirkland, Massachusetts Superintendent for Suppressing the Gypsy and Brown-tail moths, are uniting their efforts in introducing parasites of these moths from European countries. Results from such work are necessarily slow and though the parasites may in time become a most effective means of lessening the numbers of these introduced pests, as parasites already do with many native moths, for the present season at least they cannot be expected to serve for a substitute for other remedial measures.

Cutting and burning the winter nests is the most important of the remedies because it is the easiest, cheapest, and, if thoroughly done, a sufficient protection against the ravages of this pest. The webs and leaves that compose the nest are woven tightly to the tips of the branches and hang there like dead leaves all winter. With so many months for inspection there is no excuse for harboring the hibernating caterpillars on shade or orchard trees. After they are cut from the branches, the nests should be burned, as this is the simplest way of destroying the colony within.

Destruction of breeding places. Much can be done in infested districts by clearing out wild cherry tangles and other growths which serve as a breeding place for these moths.

Spraying. The caterpillars are readily killed by arsenical sprays. The remedy is most effective when applied as soon as the leaves develop in the spring. Of course where the winter nests have been destroyed there will be no need of this remedy and it is much easier to kill about 200 caterpillars enclosed in a nest than to wait until they are scattered over the tree.

LEGISLATION AGAINST THE BROWN-TAIL AND GYPSY MOTHS.

Legislation in Maine. In Maine the alarming invasion of the brown-tail moth during 1903 and 1904 emphasized the need of legislation against the ravages of dangerous insects and diseases, and in February, 1905, an act was passed to provide for the inspection of nurseries and incoming nursery stock, and placed with the Commissioner of Agriculture the duty of investigating any locality where the presence of dangerous insects or plant diseases may be suspected.

National Legislation. Appreciating the necessity of combating the brown tail and gypsy moths which threaten not alone the New England States, but the vegetation of the whole country, the last United States Congress passed an emergency appropriation of \$82,500 to be used in preventing the further spread of these insects as far as possible.

AROOSTOOK POTATO INSECTS.

Wherever native vegetation is destroyed over a large area and a cultivated crop substituted, the equilibrium of insect conditions is upset, and a readjustment ensues. If the plant-feeding insects of the locality are able to adapt themselves to a diet of the cultivated crop, the readjustment is of economic interest.

The potato fields of Northern Maine present an opportunity for observation along this line. Approximately 6,000 acres have been opened to the potato crop in Aroostook County during the past 16 years. What has become of the insects originally feeding upon other vegetation over these 6,000 acres is chiefly a matter of fruitless speculation. In general they have died, changed their location, or accepted the potato as an article of diet.

The inevitable Colorado potato beetle is taken philosophically here as elsewhere as a part of potato culture, and certain

fields kept clear of it by adequate spraying and, especially late in the season, certain fields given over to its ravages with apparent indifference.

Tomato Flea Beetle. Probably more serious injury to the potato vines is inflicted by the common tomato flea beetle, *Epitrix cucumeris*, than is generally credited to this insect by potato raisers, as it is found upon the leaves during the whole season, often in enormous numbers, and the punctured and riddled leaves cannot of course do full duty in such a condition.

Smartweed Flea Beetle. In addition to these two foregoing omnipresent pests, the Aroostook fields possess some more distinctive features. About the middle of September the smartweed flea beetles, *Systema hudsonias* were even more numerous than the smaller species. Both at Caribou and Houlton they were especially abundant and a potato leaf untouched by them could scarcely be found.

Cosmopepla carnifex. A pretty black and red bug, *Cosmopepla carnifex*, content before the advent of the potato to feed upon tender poplar shoots, and mint and buttercup stems, has shown no hesitation in accepting the new feeding grounds. By way of illustration it may be cited that on Sept. 12 at Caribou 11 of these bugs were found with their beaks deep in a single potato stalk. The bugs looked healthier than the stalk.

Pentatoma juniperina Linne. This large green bug, not uncommon in the State upon evening primrose, was found upon the potato, at Caribou July 11, where it was accused of wilting the stalk.

Tarnished Plant Bug. The tarnished plant-bug, *Lygus pratensis*, of evil reputation everywhere, is guilty of various annoyances in Maine. In some parts of the State, pear trees suffer through serious attack of the swelling leaf and flower buds in the spring. In a second the aster buds are "buttoned" by this bug so that "no perfect flowers can be obtained for sale." From a third, complaints accompanied by tarnished plant-bugs, state that all of many dahlia blossoms are deformed,—opening feebly only on one side. At Portland they were thick upon celery. The adults of this species can be startled from goldenrod blossoms almost anywhere in the State. It is not surprising to find such an adaptable insect taking without question the food offered it over thousands of acres of potato vines. About the middle of September different fields over a stretch of 7 miles

near Houlton were visited. All these fields were infested by the tarnished plant-bugs, and in one field visited early in the morning before the insects had warmed up enough to be much on the wing 40 or 50 plant-bugs to a single plant was not an unusual number. This fact seems an alarming one, for though the injury so late in the season may not be of great importance, the hibernating adults, if they attack the early tender shoots in the spring as is their habit on other plants, will cause much deformed and stunted growth another season. The tarnished plant-bug is not an easy foe to meet. Paris Green or other stomach poisons are useless against an insect with sucking mouth parts. Kerosene emulsion or other contact remedies are not practical for a pest which is so easily startled to flight. At the slightest disturbance the plant-bug is on the wing and in condition to return to the plants when the danger is over. From certain garden plants the plant-bug can readily be shaken onto a cloth or into a pan containing kerosene, early in the morning or on cold days when they are too sluggish to be easily alarmed. Such a means would, of course, be impractical in a potato field. There remains apparently but one vulnerable point, based upon the fact that the tarnished plant-bug hibernates in the adult condition among weeds or other rubbish. The custom of potato raisers of raking up and burning the old vines in the fall in order to have fields clear for fall plowing is therefore one of the most effectual ways of destroying the shelter of these bugs. If, in addition to clearing away the old vines, the weeds and rubbish along the edges of the potato fields should be burned on a cold day, great numbers of the tarnished plant-bugs would be destroyed with comparatively little cost and time. If the plant-bug continues to appear upon the potato vines, this means of combating it should be resorted to regularly each fall.

Nectarophora solanifolii. In a land flowing with honey dew as has been the whole State of Maine for several years past, even the potato cannot hope to escape aphid attacks. A large green species, *Nectarophora solanifolii* Ashm. has for 3 seasons attacked the potato vines in the vicinity of Houlton and elsewhere to an injurious extent. The colonies cluster thick on stem and leaf, thousands to a plant, frequently wilting the stems and drying the leaves. The worst of the attack comes between the middle of August and the middle of September in time to weaken the plant and thus effect the growth of the tubers. The

true sexes of this species do not appear upon the potato. It is not yet known what plant serves for the alternate host.

Aphis sp. This present season in some parts of Aroostook, conspicuously at Caribou and vicinity, a second species of plant louse, an undetermined and probably a new species belonging to the genus *Aphis*, has heavily infested certain fields. They were beginning to appear upon the vines about the middle of July and they had not all taken flight by the middle of September. At the later date colonies of pupæ could be found here and there at Caribou, clustered thick enough on stalk tip and new growth to hide the stalk. The bodies of these pupæ shaded from pink to salmon and from green to brown. They seem invariably to feed head down.

The presence of plant lice to such an extent upon potato vines raises several perplexing problems. If a fairly uniform attack could be reckoned on each year, the cost, benefit and practicability of emulsion sprays on the infested fields would be well worth testing. Plant louse attacks, however, are likely to be erratic, influenced by climatic conditions and by decrease and increase of parasites and predaceous insects. As yet it seems to be an open question as to whether it is most practical to attempt to combat the aphids in the potato field by artificial means, or leave them to fluctuate according to natural influences. At any rate their presence is to be regretted. Even a light attack which would not preceptibly weaken the plant, probably renders it more susceptible to fungus diseases than it would normally be. For the past 3 years the aphid attacks on potato have been widespread. Dr. James Fletcher, Central Experimental Farms, Canada, writes from Ottawa, September, 1906, "The aphid has been extremely abundant on our potatoes all through this part of Canada this year." It also troubled Canadian fields in 1904.

ALDER BLIGHT AND ATTENDANT INSECTS.

A conspicuous illustration of the natural fluctuations of insect conditions is given by *Pemphigus tessellata* in the vicinity of Orono. This species, a large dark bodied plant louse infesting the trunks and branches of alder (*Alnus incana*), is often mistaken for fungus on account of the snow-white flocculent matter with which it is covered. For several seasons the alder clumps here as in many other parts of the State have been white stemmed with this woolly plant louse, and early in September the air has been alive with the winged forms.

Syrphus maggots. The chief enemy which had for two seasons confronted the "alder blight" was a syrphus fly, which could be seen hovering near the colonies for the purpose of depositing eggs. The maggots hatched from these eggs fed greedily upon the large soft bodied plant lice, but the enormous numbers of the plant lice did not seem to be materially lessened. The winged forms were plentiful last fall, 1905. This spring the colonies were common but not so numerous as for several seasons past. The syrphus maggots work industriously and often white "wool" upon the alder stems was found to cover more maggots than plant lice. It seems likely that the syrphus flies could clear the vicinity of "alder blight." Late in the summer, however, it was discovered that the syrphus flies no longer had the "alder blight" to themselves. A rival appeared in the form of the Harvester butterfly.

The Harvester, Feniseca tarquinius. (Fig. 19). During September caterpillars of the Harvester could be taken in almost any colony of "alder blight" in the neighborhood. Like the syrphus maggots, these caterpillars burrow beneath the woolly secretions of the plant lice and are covered from sight. The full grown caterpillar is slightly more than one-half inch in length and slug like in shape. The body is drab colored and the head a shiny brown. The 12 segments of the body are deeply creased and scalloped along the lateral margin. There is a mid-dorsal line of black dots with an orange spot at each side. Each orange spot is lined laterally with black. The body is well covered with black bristly spines to which flocculent masses from the alder blight becomes attached. The curious chrysalis (Fig. 20) of this insect is a half uncanny, wholly fascinating little object with the dorsal aspect possessing a remarkable resemblance to a monkey's face. The adult butterfly (Fig. 21) expands about one and one-fourth inches. The colors of the upper surface of the wings are black and tawny. The black spots are subject to much variation in form and size.

So industriously did the *Syrphus* maggots and the Harvester caterpillars feed upon "alder blight" that by the end of September hardly a colony of this plant louse could be found in the vicinity of Orono.

Alder blight covered by ants. In connection with a series of observations which were being made this season on alder blight, an interesting bit of ant work was noticed August 30. A colony

of ants had its quarters in some small decaying tree trunks fallen at the base of a clump of alder. Two of the alder stems were thickly infested with *Pemphigus tessellata* much visited by ants for the honey dew. In this case the ants had built a covered tunnel from the base of the alder stems to the distance of nearly 2 feet on one stem and more than one foot on another. This structure was composed of sawdust-like particles and enclosed small clusters of the aphids which seemed undisturbed by the proceedings. The stems were upright and one ant tunnel was erected vertically along the stem while the second was more or less winding. The ants varied their occupation of extending the tunnel with sipping upon the convenient honey dew. Specimens of these ants were identified by Mr. Theo. Pergande of the U. S. Department of Agriculture as *Lasius mixtus* Mayr.

LARCH CASE-BEARER, *Coleophora laricella* Hbn.

Throughout Washington, Hancock, and Penobscot counties at least, and probably over a larger area a very minute moth has been to work on the larch, (*Larix americana*), or hackmatack, or tamarack as it is variously called.* The insect winters in the larval stage upon the larch and attacks the tender needles when they first start in the spring. Although minute they have been present in such enormous numbers that larch trees have often been, during the past 3 seasons, eaten bare of green early in the spring. The caterpillars feed by eating a hole in the side of the needle and then devouring as much of the inner portion as it can reach. It thus has the characteristic manner of feeding common to related leaf miners. The injured needles often continue to grow but the clusters are ragged and many of the needles brown and dry. Small larches in the vicinity of Bangor and Orono which have been subjected to an attack of at least 3 seasons died this summer from no other apparent cause than the presence of great numbers of the case-bearers which kept the needles eaten off. Many large larches infested by this insect look yellowish and unhealthy.

The larva. The caterpillar is a case-bearer, that is, it protects its body with an external covering or case. The larch case-

* Although so well supplied with popular names of its own, this tree is also erroneously but very commonly called the juniper in Maine.

bearer uses a bit of dried spill from the larch for its case and from this protection it extends its head and thoracix feet when it wishes to move about or feed. Along the ventral side the spill is split and pieced together with silk woven by the tiny caterpillar. As it grows it weaves an extension of this silk on the anterior part of the case. The full grown caterpillar is about 3 millimeters * in length. The case measures 4 millimeters or 5 millimeters. The caterpillars are much more active during warm and sunny weather, and during cold days they do no feeding. When fall comes on the nearly grown caterpillars in their little spill cases attach themselves to the bark and about the bud angles and live dormant for the winter. With the first warm days of spring the caterpillars become active and feed upon the soft tender larch needles. As the caterpillars are nearly full grown this is their most vigorous feeding spell and as the larch needles are eaten when they first begin to grow, it is a particularly hard season of the year for the tree to endure such an attack. The same number of case-bearers later in the season would by no means create so much damage.

The full grown caterpillars do not leave their cases but attach them to the twig or commonly in the cluster of needle shaped leaves where they are not easy to find and let the cases serve for a cocoon.

The moth. In the vicinity of Orono the adult insect emerges about June 4. They are a glistening ash gray in color. The wings are slender and the hind wings have the deep delicate fringe common to this group of moths. It expands about 9 millimeters. This moth is something the shape of the common clothes moth and a little smaller. The female deposits the eggs in among the larch needles and the young naked caterpillar eats its way into a needle and after disposing of the soft interior as food, uses the empty shell for its case.

There is fortunately but one generation a year. Observations upon these case-bearers about Orono had been made during 2 seasons when Dr. James Fletcher, Central Experimental Farm, Ottawa, published his interesting account of the appearance of the Larch case-bearer, *Coleophora laricella* in Canada (Report 1905). Doctor Fletcher kindly compared specimens bred in Maine with the Canadian *Coleophora* and pronounced them undoubtedly the same species. Ratzeburg in his *Forst-Insecten*

* One inch nearly equals 25 millimeters.

gives excellent figures in color of the larva, moth, and work of *Tinea laricinella* which if it is not the same species as *Coleophora laricella* so closely resembles it that the same figure would serve for both.

There would not seem to be any practical remedy against this insect in large growths. Since it eats the inner portion of the needles and leaves the epidermis, arsenical sprays would hardly avail on the larches used for ornament. In nurseries, badly infested trees should be burned. From very small trees the majority of the cases could be removed by hand during the winter. Japanese Larches * are said to be immune from attack by this case-bearer.

MISCELLANEOUS NOTES.

Of the many insects which naturally come under observation during the season, a few are conspicuous for various reasons, as the attendance of particular parasites, the occurrence in great numbers of an insect not usually abundant, or the appearance of an insect on some plant it does not commonly attack. Such instances are often of more than passing interest and are conveniently recorded under miscellaneous notes of the year.

Yellowhead Cranberry Worm on Sweet Gale. The yellowhead cranberry worm, *Teras minuta*, was present this season over cranberry beds near Charlotte. The culture of these beds had been somewhat neglected and sweet gale, *Myrica gale* had crowded into the beds from all directions. The tips of the sweet gale were everywhere conspicuously spun together and examination showed the culprit to be the yellowhead cranberry worm which was working also in the cranberry vines. The pest was attacking the sweet gale to a much greater extent than it was the cranberry itself. This fact was so marked that it suggested, as apparently practical, a simple remedial treatment for this locality. It was recommended that all of the sweet gale, which was injuring the cranberries by its presence as a weed, should be torn out except strips of it near the edges of the beds which were to be left as a trap. The sweet gale, left as attractive bait for the yellowheads, could be treated to a heavy spray of arsenate of lead early in the spring, in time for the first brood of larvæ, thus killing in small space the majority of the pests. The beds, it should be stated, are in a dry bog and resort

* Insect Life. Vol. IV. Page 405.

to flowing would mean considerable expense. The same insect was present at Charlotte upon apple trees but not to a great extent.

The Apple Maggot and the Codling Moth. Both these insects are at work in this State to a regrettable and injurious extent. There is considerable confusion among orchard owners as to the character and names of these two pests. The term "apple maggot" is unfortunately applied indiscriminately to the larva of "Trypeta" and the codling moth, and the term "railroad worm" is not much more definite, especially if the trails extend away from the surface of the apple. The present season one man reported that nearly all his apples were "ruined by the 'railroad worm' or 'wire worm' as it is sometimes called." In view of such confusion the following brief statement may not be amiss.

"Apple maggot," "railroad worm," and "Trypeta" should all properly apply to the larva of a striped winged fly, *Rhagoletis (Trypeta) pomonella*. This larva is a *maggot*, a small but plump, white, footless object with head so ill defined that it is difficult to find at all, and the mouth parts reduced to a pair of hooks. The apple maggot works in soft discolored mushy trails anywhere in the pulp of the apple. When these trails lie immediately under the skin of pale skinned apples they show through like tiny but clearly defined tracks, and the descriptive term "railroad worm" has been given the maggot which travels along these tracks. The trails of the apple maggot never contain little round sawdust like pellets, and they do not extend into the core of the apple.

The codling moth (*Carpocapsa pomonella*) is a true moth. The fore wings are irregularly streaked with gray and brown, and have a horseshoe marking of copper color at the inner angle. The hind wings are of light yellowish brown. The moth expands about three-fourths of an inch. The larva of this moth is a tiny naked *caterpillar* with clearly defined head region and three pairs of legs upon the segments immediately behind the head. It has the ordinary biting mouth parts of other caterpillars and resembles the closely related leaf folding caterpillars (Tortricids) in its motions, wiggling violently backward when disturbed. The larva of the codling moth makes excavations in the apple, extending them usually into the core itself. These excavations always contain little, round, brown, sawdust-like, pellets which are the excretions of the larva.

The apple maggot and the larva of the codling moth are often present in the same apple. Discussions of the life history, habits and remedies of these two pests are given in other available bulletins of this Station and are therefore not repeated here.

Lace Bugs. The recently described * Tingitid, *Corythuca pergandei* Heid. was extremely numerous upon willow and alder (*Alnus incana*) between Bangor and Orono this season.

Infested Spruce Cones. Late in August the cones on the Norway spruces on the campus were observed to be dropping prematurely. Examination showed a general infestation by a Lepidopterous larva about seven-eighth of an inch in length. Some were a uniform purplish brown, others showed a greenish color on the thoracic segments with 2 tiny black spots on the first segment behind the head. These larvæ began spinning cocoons about the middle of September. The cocoons are the color and transparency of thin white tissue paper. The average length is about one-half inch and they are usually about one-fourth of an inch wide, though sometimes the cocoons are nearly as broad as long. Pupation does not take place at once but the caterpillar, readily seen through the thin cocoon, lies for days in a U shaped loop. If the cocoon is disturbed, the caterpillars break through and travel off actively and with apparent irritation. The infested cones were prematurely brown in the vicinity of the larval tunnels. The excavations were chiefly at or near the center of the cones, from one to several larvæ being present in a single cone. Through the kindness of Doctor Howard specimens were referred to Mr. Fiske (Bureau of Entomology, Washington, D. C.) who stated them to be evidently a species of *Pinipestis*, mature moths being necessary for full determination.

Maggots which were attacking the decaying portion of the cones infested by these caterpillars developed in abundant numbers into *Drosophila amæna* Loew, kindly determined by Mr. D. W. Coquillett. This small red-eyed fly with yellow thorax and dark abdomen, and wings crossed with 2 dusky bands, is not uncommon about decaying fruit.

Harvest fly, *Tibicen rimosus*. A very pretty harvest fly, or cicada, belonging to the same genus as the periodical Cicada was common in the vicinity of Orono from the middle to the latter part of July. (A photograph of this species is given as Fig.

* Proceedings of the Entomological Society of Washington, Vol. VIII Nos. 1-2.

22.) The head and thorax have clearly defined marks of deep orange yellow, along the posterior margin of each abdominal segment is a narrow but distinct line of the same color, and the wings near the body are clouded also with orange. The expanse of wings averaged about 2 and one-half inches. The species was kindly determined by Mr. Heidemann as *Tibicen rimosa* Say, var: *noveboracensis* Fitch.

Diamond-back Moth, Plutella cruciferarum, as a Greenhouse Pest. Early in April a complaint came from a greenhouse in Ellsworth of a small green caterpillar which destroyed ten weeks stocks, working on leaves and flowers. Specimens were received with the communication and were bred to the adult stage, part of them proving to be the light form and part the dark form of the Diamond-back. On May 24, a new lot of these larvæ were received from the same source again at work upon the stocks. This species, described with reference to materials bred on stocks in greenhouse, is as follows:

The caterpillars when full grown are three-eighths of an inch in length. The color is a light green with the head concolorous or sometimes shading to yellowish. The median dorsal line is a more vivid green. To the naked eye they appear smooth, but a low power glass reveals stiff dark hairs rising from lighter spots arranged in a regular manner upon the segments. These hairs are most numerous upon the last thoracic segment. The last pair of abdominal pro-legs are extended back horizontally giving the body a forked appearance. The pupal stage is passed within a very delicate white, gauzy cocoon through which the pupa is readily seen. Some of the specimens reared passed but 6 days in the pupal stage.

The perfect insect is a moth expanding about five-eighths of an inch. The fore wing is ash colored with minute dark spots upon it. A yellowish stripe outlined with a dark line extends along the hinder margin in such a manner that when the wings are closed, 3 light colored diamond shaped markings are formed. Both pairs of wings are a uniform gray on the under side. The antennæ are marked with alternate rings of white and dark.

The Diamond-back is an imported moth and it occurs frequently upon cabbage and cauliflower in the garden. Doctor Fletcher reports* the Diamond-back to be an incessant and most troublesome pest upon garden stocks and wall-flowers

* Can. Exp. Farms 1890, p. 165.

from about July till the frosts in November. The remedy most frequently recommended is kerosene emulsion.

The greenhouse infestation at Ellsworth started on stocks that had been transplanted from outside and the larvæ were probably taken in with them, successive generations developing within doors. Hand picking proved to be a perfectly effectual remedy though a tedious task.

Six Troublesome Orchard Insects. The yellow-necked caterpillar, *Datana ministra*, and the red-humped caterpillar, *Ædemasia concinna*, have created much alarm in Maine this year. Entire orchards have been despoiled by these pests. Young trees have suffered the worst injury not because the caterpillars show a preference for them, but because one brood is sufficient to strip a small tree, and the same number of leaves from a large tree does not mean so serious a loss. The bud moth, *Tmetocera ocellana*, is at present doing much damage in Maine orchards. Two species of tussock moths, *Notolophus leucostigma* and *antiqua* have been abundant in most parts of the State as has the orchard tent caterpillar.

Limneria guignardi Prov. The red-humped caterpillars have been in the southern counties abundantly attended by an ichneumon parasite, *Limneria guignardi* Prov.* These parasites attack the young caterpillars in the early stages, at which time the caterpillar is just the right size to serve for food for a single parasite. The parasite grub when full grown forms its cocoon within the empty skin of the caterpillar which fits tight over the cocoon. The caterpillar head being still attached, the object is a curious one. When about to emerge the adult parasite gnaws a hole at one end of the cocoon and takes wing. This hole is sometimes near the head and sometimes near the caudal end of the caterpillar skin. See Fig. 23.

Yellow-edge Butterfly. From York to Aroostook counties the spiny caterpillars of the yellow-edge butterfly, *Euwanessa antiopa*, have been common on elm and willow. This species has been almost constantly mistaken for gypsy caterpillars, and has been the cause of numerous false alarms. A brood is occasionally found upon apple trees, but it does not seem likely to become an orchard pest, its preference is so evidently for willow

* Determined by comparison with Canadian material through the kindness of Doctor Fletcher.

and elm. A *Tachina* parasite is active against these caterpillars in Maine.

Garden Fleas. In contrast with the past two seasons no observations of the garden flea, *Smynthurus albamaculata*, Harvey were made. During the early spring, at the time these minute insects have previously been most conspicuous, continuous rains prevented field observations on such insects as these. The account of injury due to this species given in Bulletin No. 123 of this Station, page 220, was the occasion of several requests from specialists in this group for reference to the original description. Professor Harvey's description together with drawings by Mr. J. H. Emerton were published in the Report of this Station for 1896, pages 124-126.

Mosquitoes. There is no adequate record of Maine mosquitoes although in many parts of the State certain species are excessively troublesome. A few collections were made this season and sent to the Bureau of Entomology, Washington, D. C., where several specialists are at work on this family. Doctor Dyar kindly determined them as follows:

Anopheles punctipennis Say. Orono, July 27 and October 1, about light in house.

Anopheles quadrimaculatus Say. Orono, September 20, in house.

Aedes fuscus O. S. Orono, July 27.

Aedes canadensis Theob. Trenton, August 10; Caribou, August 17.

Aedes sylvestris Theob. Trenton, August 10.

Aedes sollicitans Walk. Trenton, August 10.

Aedes abfitchii Felt, *fitchii* Felt, or *subcantans* Felt. (Adults alike—need larvæ to separate). Orono, August 3; Trenton.

All of the species of *Aedes* except *fuscus* given in the foregoing list were until recently commonly referred to the genus *Culex*.

Insects for Identification. A few, only, of the large number of insects received for identification this season are recorded in the following pages.

Such common, widespread, and constantly occurring forms as the cecropia moth and oyster-shell scale have been omitted. Such information as the increasing parasitism of the red-humped caterpillar has been summarized in a single statement elsewhere in the bulletin rather than listed as 70 or 80 separate items.

INSECTS RECEIVED FOR IDENTIFICATION.

Name.	Date.	Host.	Locality.	Remarks.
Nessus sphinx, <i>Amphion nesusus</i>	June 14	.....	Orono.	Adult.
Galun sphinx, <i>Delaphila chamenerii</i>	June 14	.....	Orono.	Adult.
Wild cherry sphinx, <i>Sphinx drupiferarum</i>	June 16	.....	Orono.	Adult common.
Thysbe clear wing, <i>Hemaris thysbe</i>	June 18	.....	Bar Harbor.	Moth on lilac blossom.
Azalea sphinx, <i>Ampelophaga choerilus</i>	June 29	.....	Orono.	Male
Small eyed sphinx, <i>Panonia myops</i>	July 14	.....	Orono.	Adult.
Big poplar sphinx, <i>Panonia modesta</i>	July 13	.....	Orono.	Adult.
Pen marked sphinx, <i>Sphinx chersis</i>	July 14	.....	Bangor.	Female.
Apple sphinx, <i>Sphinx gordius</i>	July 17	.....	New Vineyard.	Female.
Laurel sphinx, <i>Sphinx latania</i>	July 27	.....	Orono.	Adult.
Morning sphinx, <i>Deilephila lineata</i>	Aug. 1	.....	Eden.	Larvæ full grown.
Twin spotted sphinx, <i>Smerinthus geminatus</i>	Aug. 1	.....	Waterford.	Adult.
Woodbine sphinx, <i>Pholis achenon</i>	Aug. 14	Woodbine.	North Berwick.	Larvæ "appear every year".
Four horned sphinx, <i>Ceratomia quadricornis</i>	Sept. 1	.....	Houlton.	Larvæ.
Walnut Datana, <i>Datana angustif.</i>	Sept. 22	Walnut.	North Berwick.	Larvæ numerous, specimen parasited.
Walnut Datana, <i>Datana angustif.</i>	Aug. 27	Walnut.	North Berwick.	Trees entirely stripped of leaves.
Unicorn prominent, <i>Schizura unicornis</i>	Aug. 22	Apple.	Green.	
Unicorn prominent, <i>Schizura unicornis</i>	Aug. 28	Apple.	Jonesboro.	
Unicorn prominent, <i>Schizura unicornis</i>	Sept. 1	Apple.	Deer Isle.	
Unicorn prominent, <i>Schizura unicornis</i>	Sept. 14	Apple.	North Jay.	
Hag moth, <i>Phoberon pithectum</i>	Aug. 29	.....	North Buckfield.	Cocoon.
Yellowhead cranberry worm, <i>Teras minuta</i>	Aug. 29	Cranberry.	Charlotte.	Larvæ numerous.
Lesser apple leaf folder, <i>Teras minuta</i>	Aug. 29	Apple.	Foxcroft.	Larvæ numerous in orchard.
Fork-tailed caterpillar, <i>Cerura borealis</i>	Sept. 7	.....	Weeks Mills.	Larvæ.
Apple Bucculatrix, <i>Bucculatrix pomifoliella</i>	Sept. 10	Apple.	East Corinth.	Ribbed cocoons numerous.
Apple Bucculatrix, <i>Bucculatrix pomifoliella</i>	Sept. 15	Apple.	Manchester.	Ribbed cocoons.
Hickory tiger moth, <i>Halsidota caryæ</i>	Oct. 17	Apple.	Drew.	
Lappet moth, <i>Folyte velleda</i>	Sept. 31	Apple.	East Orlington.	Larvæ full grown.
Beautiful wood nymph, <i>Eudryas grata</i>	Aug. 6	.....	Hampden Corner.	Adult.
Pearly wood nymph, <i>Eudryas unio</i>	July 23	.....	Orono.	Adult.
Tussock moth, <i>Nokolophus leucostigma</i>	Aug. 7	Raspberry.	Norridgewood.	Much damage.
Fingered dagger moth, <i>Acronycta dactylina</i>	Aug. 18	.....	Ellsworth.	
Crompton tortoise, <i>Vanessa j-album</i>	Sept. 7	Maple.	Bar Harbor.	Larvæ.
The Relict, <i>Catocala relictæ</i>	Sept. 23	.....	Charlotte.	Adults very common.
Scalloped Owllet, <i>Scoliopteryx libatrix</i>	Sept. 9	.....	Orono.	Adults on birch bark.
.....	Feb. 16	.....	Gardiner.	Dead moth.

Diamond back moth, <i>Plutella cruciferarum</i>	April	2 Stocks	Ellsworth	Larvæ destructive in greenhouse.
Budmoth, <i>Imetocera ocellana</i>	June	13 Apple	Turner	Larvæ.
Spruce tortrix, <i>Tortrix funiferana</i>	June	20 White spruce	Bar Harbor	Larvæ.
Larch case bearer, <i>Coteophora laricella</i>	June	26 Larix americana	Machias	Larvæ seriously stripping trees.
Cherry tree leaf folder, <i>Cacæcia cerasinorana</i>	July	2 Wild cherry	Watford	Nest and pupæ.
Cherry tree leaf folder, <i>Cacæcia cerasinorana</i>	July	13 Wild cherry	Skowhegan	Nest, larvæ and pupæ.
Oak ugly nest, <i>Cacæcia ferradana</i>	Aug.	1 Oak	Bar Harbor	Destroying much.
Stalk borer, <i>Papaipema nitela</i>	July	14 Sweet corn	Cape Elizabeth	Moths common in closed flowers of ænothera biennis.
Primrose moth, <i>Rhodophora fiorita</i>	July	27	Orono	Numerous.
Twice stabbed Lady beetle, <i>Chilocorus bivulverus</i>	Aug.	29 Plant-lice	Ellsworth	On house plants.
16-spotted Lady beetle, <i>Anatis 15-punctata</i>	June	7 Plant-lice	New Vineyard	Grubs worked two acres grass land so that it plowed like old ground.
Saw tooth grain beetle, <i>Sitona surinamensis</i>	March	15 Flour	Farmington	½ acre completely stripped by middle of August.
White grubs, <i>Lachnosterna</i>	June	5 Grass roots	Harrison	Identified by Dr. Chittenden.
Asparagus beetle, <i>Crioceris asparagi</i>	Sept.	17 Asparagus	Brunswick	Numerous.
Beautiful maple borer, <i>Plagiotus speciosus</i>	Sept.	18 Maple	Unity	Numerous.
Malachius æneus	June	20	Orono	Galls.
Tortoise beetle, <i>Coptocycla signifera</i>	July	24 Convolvulus se plum	Orono	Galls numerous.
Tortoise beetle, <i>Coptocycla purpurata</i>	Sept.	13 Convolvulus se plum	Orono	Thickly infested.
Spindle gall, <i>Pomphigus ulmi-fusus</i>	July	13 Elm	Orono	In great numbers.
Pineapple gull, <i>Chermes abietis</i>	Aug.	14 Poplar	North Berwick	Work on pear leaves.
Chionaspis salicis	Sept.	1 Spruce	Caribou	Feeding on the stalk, wilting it.
.....	Sept.	15 Viburnum alni-folium	Portland	Troublesome every year.
.....	June	23 White oak	Houlton	Numerous.
.....	Sept.	1 Pear	Freedom	Enormous numbers.
.....	July	11 Potato	Pittsfield	Deformed and buttoned blossoms.
.....	July	24 Geranium	Caribou	Great numbers.
.....	Oct.	1 Celery	North Berwick	Great numbers.
.....	Sept.	15 Potato	Portland	Great numbers.
.....	Sept.	23 Dahlia	Houlton	Great numbers.
.....	July	24 Wax work	Charlotte	Common.
.....	Aug.	1 Woodbine	N. Berwick	Abundant.
.....	Sept.	10 Birch sprouts	Bangor	Larvæ adults numerous in berry clusters.
.....	Aug.	4 Mint	Orono .....	.....
.....	Sept.	12 Potato	Caribou .....	.....
.....	Sept.	15 Poplar	Houlton .....	.....
.....	Sept.	15 Willow	Houlton .....	.....
.....	Sept.	15 Mountain Ash	Houlton .....	.....

INSECTS RECEIVED FOR IDENTIFICATION—CONCLUDED.

Name.	Date.	Host.	Locality.	Remarks.
<i>Ichnumon, Thalesa lunata</i>	Aug. 22	.....	E. Wilton.....	Female.
Pear tree slug, <i>Eriocampa cerasi</i>	Sept. 24	Cherry & Plum	Corinna.....	Bad attack.
Rose slugs, <i>Monostegia rosea</i>	July 18	Rose.....	Hancock Pt.....	Ruined appearance of bushes for four years.
Blackberry seed gall, <i>Diastrophus cuscuteiformis</i> ..	May 4	Cultivated blackberry	Gardiner.....	
Giant American saw fly, <i>Cimbex americana</i>	Aug. 14	Elm.....	S. Berwick	Larva full grown.
Solitary wasp, <i>Eumenes fraternus</i>	Aug. 29	.....	Gardiner	"Jug nest" and wasp which emerged.
King grasshopper, <i>Limneria quigrardi</i>	Aug. 29	.....	Augusta	Parasites bred from <i>Cedemasia concinna</i> .
Sheep bot-fly, <i>Hippiscus tuberculatus</i>	June 2	.....	Hampden Cor.....	Male and female adult.
.....	May 3	Sheep	E. Dixfield	Maggots in nasal passages apparently caused death of sheep.
Maple spot-gall, <i>Sciara ocellata</i>	July 2	Maple.....	Seal Harbor.....	
<i>Psocids</i>	Aug. 14	Maple and mulberry	N. Parsonfield	On bark in "large droves".
<i>Psocids</i>	Aug. 14	Maple.....	Alfred	On bark "by thousands".
<i>Psocids</i>	Aug. 18	Maple.....	Lovell	On bark in great numbers.

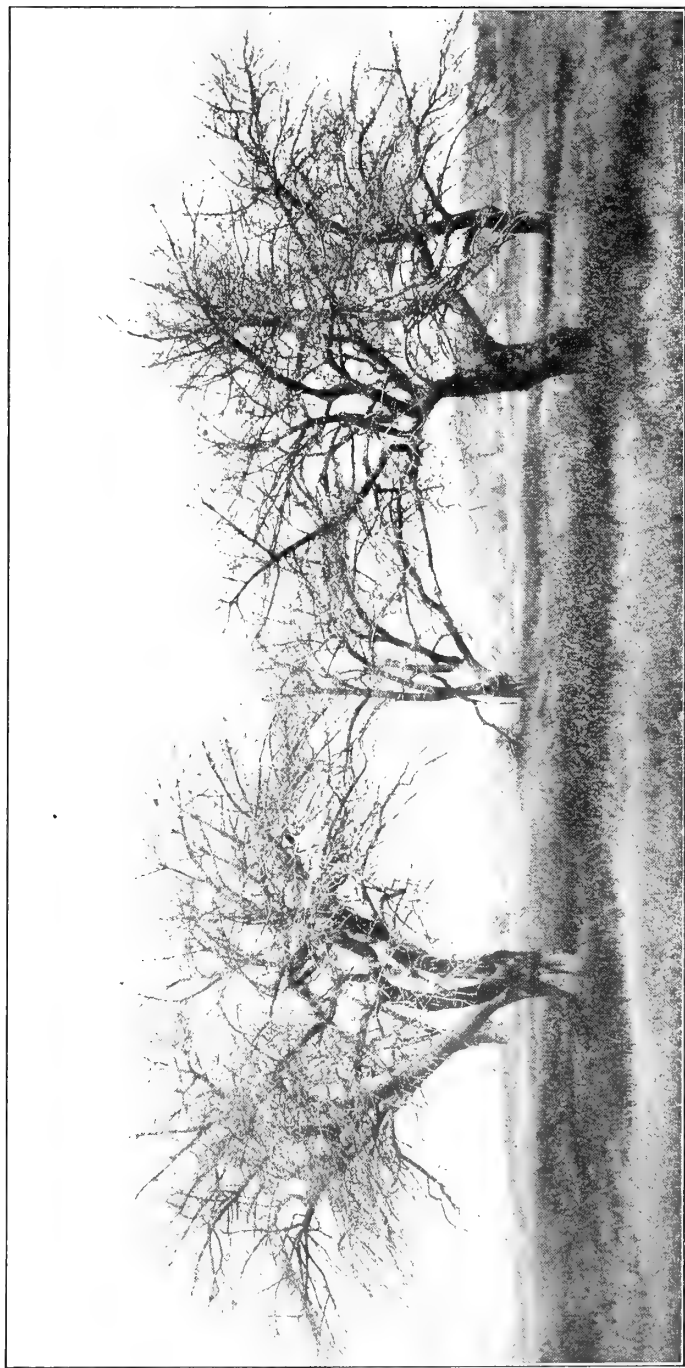


Fig 16. Apple trees stripped by brown-tail moth, Winchester, Mass., June 9, 1905.
Photograph loaned by A. H. Kirkland



Fig. 17. Winter nest of brown-tail moth with one attachment to twig.

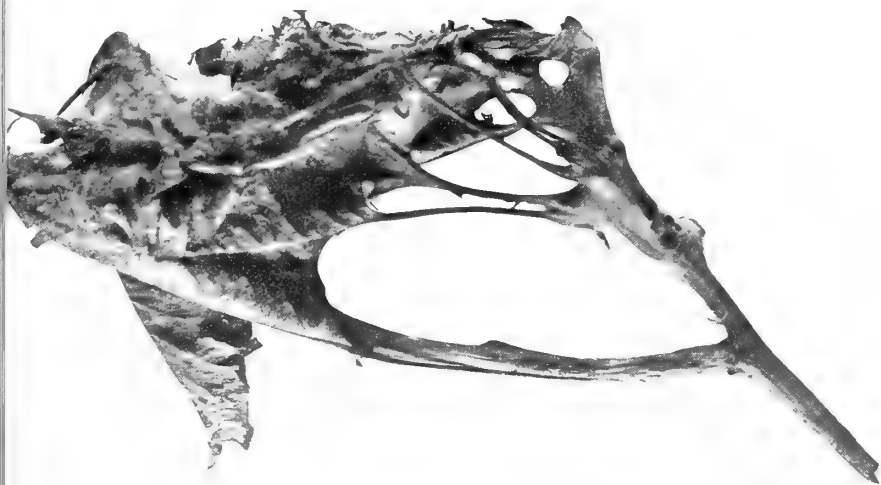


Fig. 18. Winter nest of brown-tail moth with several attachments to twig.

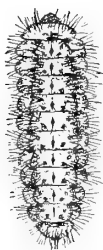


Fig. 19. The Harvester.
Larva x 2.



Fig. 20. The Harvester.
Chrysalis x 2.

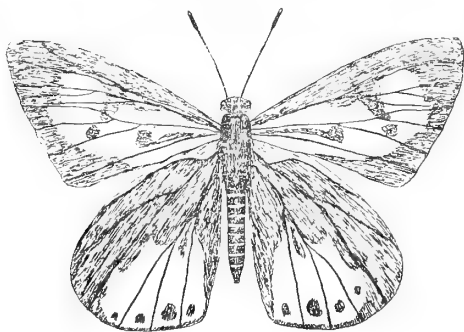


Fig. 21. The Harvester, *Feniseca tarquinius*.
Adult x 2.

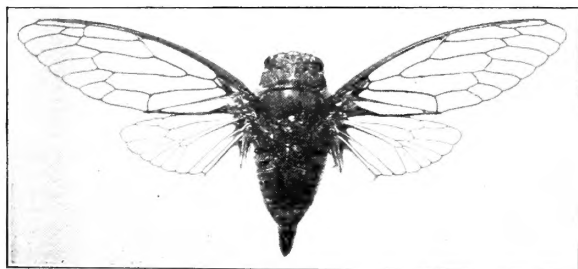


Fig. 22. Harvest fly or Cicada, *Tibicen rimosa* Say, *noveboracensis* Fitch. Very slightly enlarged. Photograph of specimen taken at Orono, July 31, 1906.

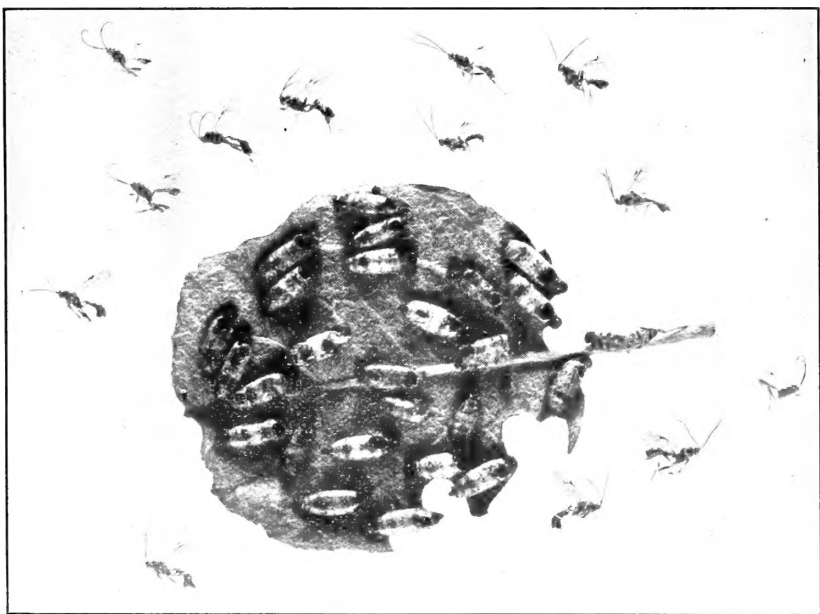


Fig 23. Parasitized specimens of young red humped caterpillars attached to apple leaf, and parasites, (*Limneria guignardi*, Prov.), which emerged from them. Photographed from specimens taken at West Minot, August 29, 1906.

Circulars concerning the following insects are available for distribution and will be sent to any address in the State upon request.

Cecropia moth.

Tussock moth.

Brown-tail moth.

Red-humped caterpillar.

Yellow-necked caterpillar.

Tent caterpillar.

Yellow-edge butterfly.

Elm leaf curl.

White grubs and June beetles.

Cottony grass scale.

Gypsy moth.